

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method ~~executed in a computer system for~~
producing a model of a combination of a plurality of systems, the method ~~producing a~~
~~combined system of partial differential equations~~ comprising:

representing each of ~~[[a]]~~ said plurality of systems as an application mode
modeling physical quantities of said each system;

determining a representation of a partial differential equation system for each
application mode corresponding to one of said plurality of systems using at least one non-
local coupling, said at least one non-local coupling defining a value from a first portion of a
first domain to another part of a second domain; and

producing a model of the combination of said plurality of systems by forming
said combined system of partial differential equations using partial differential equation
systems associated with said plurality of systems.

2. (Original) The method of claim 1, wherein at least one of said partial
differential equation systems uses at least one local coupling.

3. (Original) The method of claim 1, wherein said first and second domain
are the same.

4. (Original) The method of claim 1, wherein said first and second domain
are different.

5. (Original) The method of claim 1, further comprising: defining a non-local
coupling wherein a value of a quantity on a boundary of said first domain are referenced in
defining parallel lines extending into the domain.

6. (Original) The method of claim 1, further comprising: defining a non-local
coupling in which a boundary condition associated with said first domain is defined using a
value of an integral over a portion of one of: said first domain and said second domain.

7. (Original) The method of claim 1, further comprising: defining a non-local coupling using at least one of: a mapped variable and an integrated variable.

8. (Original) The method of claim 2, further comprising: defining a local coupling using at least one of: a basic variable, an expression variable, and a glued variable.

9. (Original) The method of claim 1, further comprising: defining a non-local coupling variable using at least one of: an extrusion variable, a projection variable and a scalar variable.

10. (Original) The method of claim 1, further comprising: determining a stiffness matrix by determining a Jacobian of each variable in accordance with each type of variable wherein said combined system of partial differential equations is in weak form, said stiffness matrix being a Jacobian matrix formed from a residual vector with respect to a number of degrees of freedom; determining said residual vector by determining a Jacobian of each variable in accordance with each type of variable wherein said combined system of partial differential equations is in weak form.

11. (Original) The method of claim 10, further comprising: converting said combined system of partial differential equations from general form to weak form.

12. (Original) The method of claim 11, wherein said determining said stiffness matrix further comprises: determining values of a Jacobian of variables in accordance with points included in a quadrature formula and with other points in accordance coupling variables.

13. (Original) The method of claim 12, wherein said determining said residual vector further comprises: determining values of variables and a Jacobian of said variables for node points and for other points in accordance with coupling variables.

14. (Currently Amended) ~~A computer program product~~ A computer readable medium having stored thereon instructions for producing a model of a combination of a plurality of systems producing a combined system of partial differential equations comprising machine executable code for which when executed by at least one processor, causes the processor to perform steps comprising:

representing each of ~~[[a]]~~ said plurality of systems as an application mode modeling physical quantities of said each system;

determining a representation of a partial differential equation system for each application mode corresponding to one of said plurality of systems using at least one non-local coupling, said at least one non-local coupling defining a value from a first portion of a first domain to another part of a second domain; and

producing a model of the combination of said plurality of systems by forming said combined system of partial differential equations using partial differential equation systems associated with said plurality of systems.

15. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, wherein at least one of said partial differential equation systems uses at least one local coupling.

16. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, wherein said first and second domain are the same.

17. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, wherein said first and second domain are different.

18. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling wherein a value of a quantity on a boundary of said first domain are referenced in defining parallel lines extending into the domain.

19. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling in which a boundary condition associated with said first domain is defined using a value of an integral over a portion of one of: said first domain and said second domain.

20. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling using at least one of: a mapped variable and an integrated variable.

21. (Currently Amended) The computer ~~program-product~~ readable medium of claim 15, further comprising machine executable code for: defining a local coupling using at least one of: a basic variable, an expression variable, and a glued variable.

22. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling variable using at least one of: an extrusion variable, a projection variable and a scalar variable.

23. (Currently Amended) The computer ~~program-product~~ readable medium of claim 14, further comprising machine executable code for: determining a stiffness matrix by determining a Jacobian of each variable in accordance with each type of variable wherein said combined system of partial differential equations is in weak form, said stiffness matrix being a Jacobian matrix formed from a residual vector with respect to a number of degrees of freedom; determining said residual vector by determining a Jacobian of each variable in accordance with each type of variable wherein said combined system of partial differential equations is in weak form.

24. (Currently Amended) The computer ~~program-product~~ readable medium of claim 23, further comprising machine executable code for: converting said combined system of partial differential equations from general form to weak form.

25. (Currently Amended) The computer ~~program-product~~ readable medium of claim 24, wherein said machine executable code for determining said stiffness matrix further comprises: machine executable code for determining values of a Jacobian of variables in accordance with points included in a quadrature formula and with other points in accordance coupling variables.

26. (Currently Amended) The computer ~~program-product~~ readable medium of claim 25, wherein said machine executable code for determining said residual vector further comprises machine executable code for: determining values of variables and a Jacobian of said variables for node points and for other points in accordance with coupling variables.

27. (New) A system for producing a model of a combination of a plurality of systems, the system comprising:

a representation system in at least one computing device that represents each of said plurality of systems as an application mode modeling physical quantities of said each system;

a determination system in the at least one computing device that determines a representation of a partial differential equation system for each application mode corresponding to one of said plurality of systems using at least one non-local coupling, said at least one non-local coupling defining a value from a first portion of a first domain to another part of a second domain; and

an output system in the at least one computing device that produces a model of the combination of said plurality of systems by forming said combined system of partial differential equations using partial differential equation systems associated with said plurality of systems.

28. (New) The system of claim 27, wherein at least one of said partial differential equation systems uses at least one local coupling.

29. (New) The system of claim 27, wherein said first and second domain are the same.

30. (New) The system of claim 27, wherein said first and second domain are different.

31. (New) The system of claim 27, further comprising a definition system in the at least one computing device that defines a non-local coupling wherein a value of a quantity on a boundary of said first domain are referenced in defining parallel lines extending into the domain.

32. (New) The system of claim 27, further comprising a definition system in the at least one computing device that defines a non-local coupling in which a boundary condition associated with said first domain is defined using a value of an integral over a portion of one of: said first domain and said second domain.

33. (New) The system of claim 27, further comprising a definition system in the at least one computing device that defines a non-local coupling using at least one of: a mapped variable and an integrated variable.

34. (New) The system of claim 28, further comprising a definition system in the at least one computing device that defines a local coupling using at least one of: a basic variable, an expression variable, and a glued variable.

35. (New) The system of claim 27, further comprising a definition system in the at least one computing device that defines a non-local coupling variable using at least one of: an extrusion variable, a projection variable and a scalar variable.

36. (New) The system of claim 27, further comprising another determination system in the at least one coupling device that determines a stiffness matrix by determining a Jacobian of each variable in accordance with each type of variable wherein said combined system of partial differential equations is in weak form, said stiffness matrix being a Jacobian matrix formed from a residual vector with respect to a number of degrees of freedom and that determines said residual vector by determining a Jacobian of each variable in accordance with each type of variable wherein said combined system of partial differential equations is in weak form.

37. (New) The system of claim 36, further comprising a conversion system in the at least one computing device that converts said combined system of partial differential equations from general form to weak form.

38. (New) The system of claim 37, wherein the another determination system determines values of a Jacobian of variables in accordance with points included in a quadrature formula and with other points in accordance coupling variables.

39. (New) The system of claim 38, wherein the another determination system determines values of variables and a Jacobian of said variables for node points and for other points in accordance with coupling variables.